

WHAT IS CLAIMED IS:

- Sub D2
1. A vaccine comprising an immunogenic amount of a streptococcal C5a peptidase (SCP), wherein the SCP is a variant of wild-type SCP, which amount is effective to immunize a susceptible mammal against  $\beta$ -hemolytic *Streptococcus* in combination with a physiologically-acceptable, non-toxic vehicle.
  2. The vaccine of claim 1 wherein the SCP is expressed from an isolated DNA sequence encoding SCP.
  3. The vaccine of claim 2 wherein the DNA encodes a specificity crevice or catalytic domain.
  4. The vaccine of claim 3 wherein the DNA encodes a specificity crevice.
  5. The vaccine of claim 4 wherein the DNA encodes an SCP that comprises contiguous amino acid residues from about residue 260 to residue 417.
  6. The vaccine of claim 4 wherein the DNA encodes one or more of amino acid residues 260, 261, 262, 415, 416 or 417.
  7. The vaccine of claim 1 wherein the SCP is a variant of wild-type SCP in that the variant SCP has a modification at one or more of amino acid residues 260, 261, 262, 415, 416, 417, 130, 193, 295 or 512.
  8. The vaccine of claim 7 wherein the SCP is a variant of wild-type SCP in that the variant SCP has a substitution at one or more of amino acid residues 260, 261, 262, 415, 416, 417, 130, 193, 295 or 512.
  9. The vaccine of claim 8 wherein the substitution is a conserved substitution.

10. The vaccine of claim 3 wherein the DNA encodes a catalytic domain.
11. The vaccine of claim 10 wherein the DNA encodes an SCP that comprises contiguous amino acid residues from about residue 130 to residue 512.
12. The vaccine of claim 10 wherein the DNA encodes one or more of amino acid residues 130, 193, 295 or 512.
13. The vaccine of claim 2 wherein the SCP is SCPA49D130A, SCPA49H193A, SCPA49N295A, SCPA49S512A, SCPA1D130A, SCPA1H193A, SCPA1N295A, SCPA1S512A, SCPBD130A, SCPBH193A, SCPBN295A, SCPBS512A or  $\Delta$ SCPA49.
14. The vaccine of claim 13 wherein the SCP is SCPA1S512A.
15. The vaccine of claim 2 wherein the DNA encodes an SCP that varies from native SCP in that it does not contain a signal sequence.
16. The vaccine of claim 2 wherein the DNA encodes an SCP that varies from native SCP in that it does not contain a cell wall insert.
17. The vaccine of claim 1, wherein the SCP does not exhibit enzymatic activity.
18. The vaccine of claim 1 wherein the vaccine comprises a variant of a streptococcal C5a peptidase that has reduced binding activity as compared to wild-type SCP.
19. The vaccine of claim 1 which further comprises an effective amount of an immunological adjuvant.

20. The vaccine of claim 1 wherein the mammal is a of human, dog, bovine, porcine or horse.
21. The vaccine of claim 20 wherein the mammal is human.
- 5 22. The vaccine of claim 1 wherein the  $\beta$ -hemolytic *Streptococcus* is a group A *Streptococcus*, group B *Streptococcus*, group C *Streptococcus* or group G *Streptococcus*.
- 10 23. The vaccine according to claim 22, wherein the  $\beta$ -hemolytic *Streptococcus* is Group A *Streptococcus*.
24. The vaccine of claim 1 wherein the SCP is a variant of SCP from group A *Streptococcus*, group B *Streptococcus*, group C *Streptococcus* or group G
- 15 *Streptococcus*.
25. The vaccine according to claim 24, wherein the *Streptococcus* is Group A *Streptococcus*.
- 20 26. The vaccine of claim 1, which comprises a recombinant variant of a streptococcal C5a peptidase conjugated or linked to a peptide.
27. The vaccine of claim 1, which comprises a variant of a streptococcal C5a peptidase conjugated or linked to a polysaccharide.
- 25 28. A method of protecting a susceptible mammal against  $\beta$ -hemolytic *Streptococcus* colonization or infection comprising administering to the mammal an effective amount of a vaccine comprising an immunogenic amount of a streptococcal C5a peptidase wherein the SCP is a variant of wild-type SCP,
- 30 which amount is effective to immunize the susceptible mammal against *Streptococcus* in combination with a physiologically-acceptable, non-toxic vehicle.

29. The method of claim 28 wherein the vaccine comprises a variant of a streptococcal C5a peptidase that does not exhibit enzymatic activity.
30. The method of claim 28 wherein the vaccine comprises a variant of a streptococcal C5a peptidase that has reduced binding activity as compared to wild-type SCP.
31. The method of claim 28 wherein the SCP is expressed from an isolated DNA sequence encoding SCP.
32. The method of claim 31 wherein the DNA encodes a specificity crevice or catalytic domain.
33. The method of claim 32 wherein the DNA encodes a specificity crevice.
34. The vaccine of claim 33 wherein the DNA encodes an SCP that comprises contiguous amino acid residues from about residue 260 to residue 417.
35. The method of claim 33 wherein the DNA encodes one or more of amino acid residues 260, 261, 262, 415, 416 or 417.
36. The method of claim 32 wherein the DNA encodes a catalytic domain.
37. The vaccine of claim 36 wherein the DNA encodes an SCP that comprises contiguous amino acid residues from about residue 130 to residue 512.
38. The method of claim 36 wherein the DNA encodes one or more of amino acid residues 130, 193, 295 or 512.

39. The method of claim 28 wherein the SCP is a variant of wild-type SCP in that the variant SCP has a modification at one or more of amino acid residues 260, 261, 262, 415, 416 or 417.

5 40. The method of claim 39 wherein the SCP is a variant of wild-type SCP in that the variant SCP has a substitution at one or more of amino acid residues 260, 261, 262, 415, 416, 417, 130, 193, 295 or 512.

41. The method of claim 40 wherein the substitution is a conserved  
10 substitution.

42. The method of claim 31 wherein the SCP is SCPA49D130A,  
SCPA49H193A, SCPA49N295A, SCPA49S512A, SCPA1D130A,  
SCPA1H193A, SCPA1N295A, SCPA1S512A, SCPBD130A, SCPBH193A,  
15 SCPBN295A, SCPBS512A or  $\Delta$ SCPA49.

43. The method of claim 42 wherein the SCP is SCPA1S512A.

44. The method of claim 31 wherein the DNA encodes an SCP that varies  
20 from native SCP in that it does not contain a signal sequence.

45. The method of claim 31 wherein the DNA encodes an SCP that varies from native SCP in that it does not contain a cell wall insert.

25 46. The method of claim 28 wherein the vaccine further comprises an effective amount of an immunological adjuvant.

47. The method of claim 28 wherein the vaccine is administered by subcutaneous or intramuscular injection.

30 48. The method of claim 28 wherein the vaccine is administered by oral ingestion.

49. The method of claim 28 wherein the vaccine is administered intranasally.
50. A method according to claim 28, wherein the  $\beta$ -hemolytic *Streptococcus* is a group A *Streptococcus*, group B *Streptococcus*, group C *Streptococcus* or  
5 group G *Streptococcus*.
51. A method according to claim 28, wherein the  $\beta$ -hemolytic *Streptococcus* is group A *Streptococcus*.
- 10 52. The method of claim 28 wherein the SCP is a variant of SCP from group A *Streptococcus*, group B *Streptococcus*, group C *Streptococcus* or group G *Streptococcus*.
- 15 53. The method according to claim 52, wherein the *Streptococcus* is Group A *Streptococcus*.
54. The method according to claim 28 wherein the mammal is a human, dog, bovine, porcine, or horse.
- 20 55. The method according to claim 54 wherein the mammal is human.
56. The method of claim 28, wherein the vaccine comprises a variant of a recombinant streptococcal C5a peptidase, conjugated or linked to a peptide.
- 25 57. The method of claim 28, wherein the vaccine comprises a variant of a recombinant C5a peptidase conjugated or linked to a polysaccharide.
58. The method of claim 22 wherein the SCP is a variant of wild-type SCP in that the variant SCP has a modification at one or more of amino acid residues  
30 260, 261, 262, 415, 416, 417, 130, 193, 295, or 512.

59. The method of claim 22 wherein the SCP is a variant of wild-type SCP in that the variant SCP has a substitution at one or more of amino acid residues 260, 261, 262, 415, 416, 417, 130, 193, 295 or 512.

5 60. An isolated and purified peptide comprising an enzymatically inactive SCP.

61. The peptide of claim 60 wherein the vaccine comprises a variant of a streptococcal C5a peptidase that has reduced binding activity as compared to  
10 wild-type SCP.

62. The peptide of claim 60, wherein the SCP is expressed from an isolated DNA sequence encoding SCP.

15 63. The peptide of claim 60 wherein the SCP has a specificity crevice or catalytic domain.

64. The peptide of claim 63 wherein the SCP comprises a specificity crevice.

20 65. The peptide of claim 64 wherein the DNA encodes an SCP that comprises contiguous amino acid residues from about residue 260 to residue 417.

66. The peptide of claim 64 wherein the DNA encodes one or more of amino acid residues 260, 261, 262, 415, 416 or 417.

25 67. The peptide of claim 63 wherein the SCP has a catalytic domain.

68. The peptide of claim 67 wherein the DNA encodes an SCP that comprises contiguous amino acid residues from about residue 130 to residue 512.

30 69. The peptide of claim 67 wherein the DNA encodes one or more of amino acid residues 130, 193, 295 or 512.

70. The peptide of claim 60 wherein the SCP is a variant of wild-type SCP in that the variant SCP has a modification at one or more of amino acid residues 260, 261, 262, 415, 416, 417, 130, 193, 295 or 512.
- 5 71. The peptide of claim 70 wherein the SCP is a variant of wild-type SCP in that the variant SCP has a substitution at one or more of amino acid residues 260, 261, 262, 415, 416, 417, 130, 193, 295 or 512.
72. The peptide of claim 71 wherein the substitution is a conserved  
10 substitution.
73. The peptide of claim 60, wherein the SCP is SCPA49D130A, SCPA49H193A, SCPA49N295A, SCPA49S512A, SCPA1D130A, SCPA1H193A, SCPA1N295A, SCPA1S512A, SCPBD130A, SCPBH193A,  
15 SCPBN295A, SCPBS512A or  $\Delta$ SCPA49.
74. The peptide of claim 73, wherein the SCP is SCPA1S512A.
75. The peptide of claim 60 wherein the peptide varies from native SCP in  
20 that it does not contain a signal sequence.
76. The peptide of claim 60 wherein the peptide varies from native SCP in that it does not contain a cell wall insert.
- 25 77. The peptide of claim 60 wherein the SCP is a variant of SCP from group A *Streptococcus*, group B *Streptococcus*, group C *Streptococcus* or group G *Streptococcus*.
78. The peptide according to claim 77, wherein the *Streptococcus* is Group A  
30 *Streptococcus*.

79. An isolated and purified polynucleotide comprising a nucleotide sequence encoding an enzymatically inactive SCP.
80. The polynucleotide sequence of claim 79, wherein the polynucleotide is DNA.
81. The polynucleotide sequence of claim 79, wherein the polynucleotide is RNA.
82. The polynucleotide sequence of claim 80 wherein the DNA encodes a specificity crevice or catalytic domain.
83. The polynucleotide sequence of claim 82 wherein the DNA encodes a specificity crevice.
84. The polynucleotide of claim 83 wherein the DNA encodes an SCP that comprises contiguous amino acid residues from about residue 260 to residue 417.
85. The polypeptide of claim 83 wherein the DNA encodes one or more of amino acid residues 260, 261, 262, 415, 416 or 417.
86. The polynucleotide sequence of claim 82 wherein the DNA encodes a catalytic domain.
87. The polynucleotide of claim 86 wherein the DNA encodes an SCP that comprises contiguous amino acid residues from about residue 130 to residue 512.
88. The polynucleotide of claim 86 wherein the DNA encodes one or more of amino acid residues 130, 193, 295 or 512.

89. The polynucleotide of claim 79 wherein the SCP is a variant of wild-type SCP in that the variant SCP has a modification at amino acid residue 260, 261, 262, 415, 416, 417, 130, 193, 295 or 512.
- 5 90. The polynucleotide of claim 89 wherein the SCP is a variant of wild-type SCP in that the variant SCP has a substitution at one or more of amino acid residues 260, 261, 262, 415, 416, 417, 130, 193, 295 or 512.
91. The polynucleotide of claim 90 wherein the substitution is a conserved  
10 substitution.
92. The polynucleotide of claim 80 wherein the nucleic acid sequence encodes SCPA49D130A, SCPA49H193A, SCPA49N295A, SCPA49S512A, SCPA1D130A, SCPA1H193A, SCPA1N295A, SCPA1S512A, SCPBD130A,  
15 SCPBH193A, SCPBN295A, SCPBS512A or  $\Delta$ SCPA49.
93. The polynucleotide of claim 92 wherein the nucleic acid sequence encodes SCPA1S512A.
- 20 94. The polynucleotide of claim 80 wherein the DNA encodes an SCP that varies from native SCP in that it does not contain a signal sequence.
95. The polynucleotide of claim 80 wherein the DNA encodes an SCP that varies from native SCP in that it does not contain a cell wall insert.  
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96. The polynucleotide of claim 79 wherein the SCP is a variant of SCP from group A *Streptococcus*, group B *Streptococcus*, group C *Streptococcus* or group G *Streptococcus*.
- 30 97. The polynucleotide according to claim 96, wherein the *Streptococcus* is Group A *Streptococcus*.

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